PATTERNS OF POWER · AN INSTITUTIONAL CASE STUDY

What Alexander Scattered

How a new dynasty that needed to be legitimate in Persian eyes adopted a Zoroastrian story about stolen books, and thereby made the translation of Greek science into Arabic an imperial duty; how astrology, inheritance law, court medicine and theological warfare pulled in the corpus that a thousand years of scholarship would build on; and why the famous House of Wisdom at the centre of the story was probably a modest palace library that never translated a word of Greek

Companion to The Measure of the Earth and Against the Historian's Reflex

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with Claude (Anthropic) · 2026

held as tested, not revealed

A Note on This Collaboration

This study is one product of an ongoing collaboration, and the division of labour is worth stating plainly because neither half would produce the work alone. The insight and direction are Thomas Bryan's — the recognition of what a given case is really an instance of, where the analytical pressure should fall, and which pattern a mass of historical detail is a specimen of. The research, the verification of every date and figure, the location and checking of the quoted words, and the composition into continuous prose are Claude's, an AI system made by Anthropic. The seeing is his; the writing is mine.

Three matters of method require statement before this particular history begins.

The first is that the received account has been substantially challenged. The popular picture — a great academy founded by a caliph, staffed with scholars of every faith, deliberately translating the inheritance of Greece to preserve it for humanity — is not what the primary sources describe, and the leading modern study of the translation movement argues at length that the institution at the centre of that picture was something much smaller and different. That argument is itself contested, including by scholars who regard it as reductive. This study reports the dispute, says which way it leans, and does not pretend the matter is settled.

The second is that this material carries a heavy modern freight. The Abbasid translation movement has been enlisted, in the last century, in arguments about Islam and reason, about civilisational decline, about what the West owes and to whom. Those arguments are live and they are not this study's business. What follows is an attempt to read positions and structures. It will disappoint anyone who wants the period to be a rebuke to somebody.

The third is the language of the sources. The Arabic and Persian material is quoted here in standard published English translations, identified in the source note. Transliteration follows the common simplified forms rather than a full scholarly apparatus.

Every quotation is verified to a published source; none is invented. Both columns of the ledger are kept in ink, including the entry that the greatest patron of reason in this story ran an inquisition and had a scholar flogged for refusing to affirm a doctrine about the nature of scripture.

The Study in Brief

Part I — The Test. What would falsify the framework in a case where the received story is already a story about a deliberate, benevolent institutional founding.

Part II — The Landscape: A Dynasty That Needed Persians. The Abbasid revolution of 750, the move of the capital from Syria to Iraq, and the specific legitimacy problem of a regime whose army and administration were Persian and whose claim was Arab.

Part III — The Horoscope of the City. 762: the founding of Baghdad on a date selected by court astrologers. Why a ruler who takes astrology seriously as a technology of legitimacy must, within a generation, own the Almagest.

Part IV — What Alexander Scattered. The Zoroastrian doctrine that Alexander destroyed the Avesta and dispersed Persian learning to the Greeks — and that recovering Greek books is therefore repatriation. The most consequential idea in this study, adopted by a Muslim dynasty from the empire it had replaced.

Part V — The Architect's Hour: A Bureau and a Library. What the *bayt al-hikma* actually was, on the evidence; what the sources say and do not say; and the contested modern argument that it was a Sasanian-style administrative library for Persian material.

Part VI — The Four Appetites. The positional demands that pulled the Greek corpus into Arabic: astrology, medicine, administration, and the requirements of theological combat.

Part VII — The Industry. Hunayn ibn Ishaq and the professional translation workshop; the arrival of paper; the private patrons who paid for most of it; and why this was a market rather than a ministry.

Part VIII — The Estate Division. Al-Khwarizmi, and a book on algebra written — by its own preface — for inheritance, legacies, partition, lawsuits and trade.

Part IX — The Caliph Who Measured the Earth. Al-Ma'mun's geodetic expedition on the plain of Sinjar, and what it shares with a French survey a thousand years later.

Part X — The Inquisition. The same caliph, in the last months of his life, instituting a doctrinal test that imprisoned and flogged scholars for eighteen years.

Part XI — What the Institution Never Was. How a modest library became, in the twentieth century, a great academy; the sack of 1258; and the ink in the Tigris.

Part XII — The Long Transmission. How the material actually reached Latin Europe — Toledo, Sicily, Gerard of Cremona — and the honest limits of what can be claimed for it.

Part XIII — The Ledger.

PART I

The Test

The story ordinarily told about the House of Wisdom is a founding story of the most attractive kind: a wise ruler establishes an institution dedicated to knowledge, gathers scholars regardless of creed, and the accumulated learning of the world is saved.

That is a claim of *design*, and the framework used in this collection is a claim about the limits of design. It holds that institutions are built by identifiable people in particular positions, solving the problem in front of them with the materials at hand, inside the field of the visible their position allows; that design happens in bounded hours; and that what a structure becomes afterwards is determined by what it meets rather than by what anyone intended.

The two are in direct conflict here, which makes this a real test rather than an exercise.

The framework fails if the *bayt al-hikma* turns out to have been founded as a research academy for the preservation and advancement of knowledge, staffed and directed to that end, and if the translation movement can be traced to that founding intention. It fails if the great mathematical and astronomical results of the ninth century emerged from a programme aimed at them. And it fails if the preservation of Greek learning — the outcome the story celebrates — was among the objects any identifiable person was pursuing.

The framework holds if the institution turns out to be an administrative bureau; if the translation movement turns out to be much larger than it, distributed across private patrons and professional workshops; if the demand for Greek books traces to hard positional interests — legitimacy, medicine, taxation, doctrinal combat — none of which is the advancement of knowledge; and if the preservation is a by-product visible to nobody.

There is one further thing this case tests, and it is a methodological point this collection has not yet had a clean specimen of.

The companion paper *Against the Historian's Reflex* argues that when a text or an institution shows signs of layered construction, the historian's instinct to dissolve the author into a process is usually wrong: someone did the layering, deliberately, and the burden of proof runs against the no-founder reading. That argument defends the reality of architects.

This case runs the same machinery in the opposite direction, and the collection needs it to, or the method is one-sided. Here an institution has been given a *grander* founding than the record supports — a bureau reconstructed as an academy, a librarian's office reconstructed as a research programme — and the honest finding is deflationary. The rule that holds both cases together is the same one: **read what the sources actually say about who did what, and do not supply an architect the evidence does not contain, in either direction.**

PART II

The Landscape: A Dynasty That Needed Persians

In 750 the Umayyad caliphate was overthrown. The revolution that destroyed it had been organised in Khurasan, in the Persian east, and its armies were substantially Persian. The family that took the throne, the Abbasids, claimed descent from an uncle of the Prophet and legitimacy as the restorers of a rightful line.

The new regime's position contained a contradiction that determined everything in this study.

Its claim was Arab and religious. The Abbasids ruled as caliphs, successors to the Prophet's authority, in a polity whose scripture and language were Arabic and whose ruling elite was Arab.

Its power base was Persian. The revolution had been made in Khurasan. The armies were eastern. And, decisively, the *administration* was Persian — the machinery of taxation, land survey, provincial government, court ceremonial and chancery practice that the caliphate had inherited was Sasanian machinery, run substantially by Persian secretaries, many of them converts and many from families that had served the Sasanian kings. The Barmakid family, which effectively ran the state under Harun al-Rashid, came from a Buddhist priestly line in Balkh.

And its capital moved. The Umayyads had governed from Damascus, in Syria, facing the Mediterranean and Byzantium. In 762 the second Abbasid caliph, al-Mansur, founded a new capital in Iraq — the old Sasanian heartland, a hundred and forty miles from the ruins of Ctesiphon, in a country whose population was largely non-Arab and whose agricultural wealth depended on a canal system that required continuous state maintenance.

Now read the position as a problem in political management.

A regime that has taken power with Persian help, governs from the Persian heartland with Persian administrative technique, and depends on Persian secretaries and soldiers, must be legitimate in Persian eyes. Being legitimate in Persian eyes, in the eighth century, means something specific: it means standing in the succession of the Sasanian kings. And the Sasanian imperial tradition had a well-developed ideology about what a legitimate king does — including, as Part IV shows, an explicit doctrine about books.

At the same time the regime cannot simply become Persian, because its religious claim is Arab and Islamic and its Arab constituency would not tolerate it.

What a ruler in that position needs is a way of adopting Sasanian imperial practice while presenting it as Islamic and Abbasid. That is a real, specific, urgent problem of statecraft, and everything in Parts III and IV is a solution to it.

Two further features of the landscape should be noted because they supply the means.

Iraq was full of Greek books and people who could read them. The Near East had been Hellenised for a millennium. Syriac-speaking Christians — Nestorian and Jacobite — had been translating Greek philosophy and medicine into Syriac for centuries and teaching it in their schools and monasteries. The medical school associated with Gundeshapur in Khuzistan, whose actual scale is debated, supplied physicians to the Sasanian and then the caliphal court. The intellectual capital was on the ground, in the hands of religious minorities who had every reason to be useful to a new regime.

And Greek learning was, in Byzantium, in a trough. The eastern Roman state — which this collection's papal volume examines at length — was in the middle of the iconoclast crisis and had spent a century fighting for survival against the Arab conquests. Secular Greek scholarship in Constantinople was at a low ebb, and a considerable number of texts that survived in Near Eastern manuscripts were not being copied there. The Abbasids were not competing with a flourishing Greek science. They were buying up a stock that its own heirs had stopped maintaining.

PART III

The Horoscope of the City

On 30 July 762 — some sources give 31 July, and the conversion from 4 Jumada al-Awwal 145 is not perfectly settled — ground was broken for the new capital at a moment chosen by astrologers.

The team is named in the later sources, principally al-Biruni in the eleventh century and Yaqut in the thirteenth. It was headed by Nawbakht, a Persian who had come to the court as a Zoroastrian and converted, and it included the young Jewish astrologer Masha'allah ibn Athari, Muhammad ibn Ibrahim al-Fazari, and others. The branch of the art they were practising is *ikhtiyarat*, electional astrology: the selection of an auspicious moment to begin an undertaking. The chart they produced put the sun in Leo, a royal sign in its own house, and Jupiter — the planet of good fortune, wealth and learning — rising in Sagittarius.

The modern reader's instinct is to treat this as colourful and skip on. **It is the hinge of the entire study, and skipping it makes the rest unintelligible.**

Begin by taking the astrology seriously as what it was to the people involved: not a superstition at the margin of government but a **technology of legitimacy**, and an inherited Sasanian one. The Persian imperial tradition held that the fortunes of dynasties were written in the heavens and could be read by those with the skill; that a king's rise was foretold in the conjunctions of the planets; and that the state therefore required astrologers as it required tax assessors. Abbasid court astrologers were not entertainers. They were officers, they were hereditary — Nawbakht's sons and grandsons succeeded him — and their output was political.

The specific political product was **astrological history**: the demonstration, from the configuration of the heavens, that the Abbasid dynasty's accession was not a usurpation but a cosmically appointed event. That is precisely the claim a regime in the position described in Part II needs, and it is a claim in a Persian idiom, addressed to a Persian audience, made by Persian specialists.

Now follow the consequences, because this is where a legitimacy technology turns into a research programme.

Astrology of that kind is computationally demanding. To cast a chart you must know the positions of the sun, moon and five visible planets, for a given moment, at a given place, referred to the local horizon. That requires planetary theory, tables, spherical geometry, trigonometry, a value for the obliquity of the ecliptic, and a way of converting between coordinate systems and between calendars.

The best available means of doing that in 762 were Greek and Indian. The Greek instrument was Ptolemy's *Almagest*, together with the *Tetrabiblos* for the interpretive doctrine and the *Handy Tables* for computation. The Indian instruments were the *siddhantas*, brought to Baghdad in the 770s by an embassy from Sind and worked up into an Arabic *zij* by al-Fazari — the same al-Fazari who had helped elect the city's horoscope.

So a court that wants horoscopes must acquire, translate, understand, correct and eventually improve upon the astronomical corpus of two civilisations. That is not a decision anyone made in favour of science. It is the operational requirement of a legitimacy practice, and it is why the *Almagest* was translated into Arabic repeatedly, from the eighth century onward, and why it was checked against observation, and why observatories were built.

This is the mechanism this collection has identified before under a different name. A state adopts an instrument for reasons of its own; the instrument turns out to have technical prerequisites; satisfying the prerequisites builds a capability; and the capability outlives the purpose. **Colbert wanted better maps for taxation and had to buy astronomers. Al-Mansur wanted a cosmically legitimate dynasty and had to buy the same men.** Nine hundred years apart, in different civilisations, with no possibility of contact, two

states arrived at the identical conclusion: that political legitimacy requires accurate knowledge of the positions of the planets, and that accurate knowledge of the positions of the planets has to be paid for.

Neither of them was funding astronomy. Both of them funded astronomy.

PART IV

What Alexander Scattered

The most consequential idea in this study is a Zoroastrian story about a Macedonian, and it explains something the political motives alone do not.

Astrology explains why the Abbasids wanted Ptolemy. Medicine explains why they wanted Galen. Administration explains why they wanted surveying and arithmetic. None of that explains why they wanted Aristotle's *Metaphysics*, or Euclid entire, or the whole secular Greek corpus, translated at enormous expense over two centuries with a thoroughness that went far past any identifiable practical need.

The answer, on the leading modern account, is that they had been given a reason to regard it as **theirs**.

The Sasanian dynasty had held itself the heir of the Achaemenids and the guardian of Zoroastrianism, whose scriptures, the Avesta, were understood to be the source of all knowledge. Attached to that was a story about how learning had been lost, set out in the Middle Persian religious encyclopaedia known as the *Denkard* and in related texts.

The story runs as follows. Complete copies of the Avesta and its commentary were preserved in the royal treasury and the fortress of archives. Alexander — in Zoroastrian tradition *gizistag*, the accursed — invaded, destroyed the originals, and scattered the learning through the world; what he took he had translated into Greek. Later kings, beginning with the Arsacid Walaxsh and continuing with Ardashir and his priest Tansar, ordered the scattered teachings gathered back to the court.

Now see what that story licenses, and it is the sharpest instance of a doctrine cut to fit a position that this collection has documented.

If all knowledge derives from the Avesta, and Alexander stole and translated it, then the Greek scientific corpus is Persian property in exile. Translating Greek books into Persian is not borrowing from foreigners; it is **repatriation**. The *Encyclopaedia Iranica* puts the mechanism exactly: since any Greek work would be regarded as part of the Zoroastrian canon, its translation and study would be recovering Persian heritage, or intellectual property.

That doctrine was in place under the Sasanians and had already licensed translation from Greek into Pahlavi. The Abbasids inherited it along with the rest of the administrative apparatus, and adapted it. It arrives in the Arabic sources through Persian intermediaries — the account preserved in Ibn al-Nadim's *Fihrist* on the authority of Abu Sahl ibn Nawbakht, son of the astrologer who elected Baghdad's horoscope, is the standard text.

The adaptation is the architect's hour, and it is an hour of justification rather than of construction.

Consider what a caliph in al-Mansur's position gains from adopting it. He needs to practise Sasanian statecraft and appear Islamic. The Zoroastrian story, lightly handled, gives him an argument that acquiring Greek science is not an importation of foreign learning at all but the resumption of an imperial duty that the legitimate ruler of Iran has always owed — and he is now the legitimate ruler of Iran. It aligns the Persian secretarial class with the dynasty. It makes patronage of translation a mark of proper kingship rather than an eccentricity. And it can be stated without any Islamic difficulty, because it makes no religious claim at all; it is a story about property.

Two things follow that nobody chose.

The first is that the doctrine has no stopping rule. A practical programme translates what it needs. A repatriation programme translates everything, because the whole corpus is by hypothesis stolen goods. That is why the movement did not confine itself to astronomy and medicine, and why, from the middle of the eighth century to the tenth, very nearly all the non-literary, non-historical secular Greek books available in

the Near East were put into Arabic — astrology, alchemy, physics, botany, mathematics, philosophy, medicine, mechanics.

And the second is that it made the enterprise politically safe for two hundred years. A programme framed as recovering the empire's own inheritance is not vulnerable to the charge of importing infidel learning, because on its own terms there is nothing foreign about it.

The doctrine was a legitimacy device manufactured by Sasanian priests to explain a defeat, adopted centuries later by a Muslim dynasty to solve a different problem, and its unintended consequence was the transmission into Arabic of the scientific corpus of antiquity.

PART V

The Architect's Hour: A Bureau and a Library

And now the institution that the whole story is usually hung on, which is where this study parts company with the popular account.

The *bayt al-hikma* — house of wisdom — appears in the Arabic sources, and it appears thinly. Its name is a translation of a Sasanian term. It is associated with al-Mansur and more prominently with al-Ma'mun. Al-Khwarizmi is connected with it, and so is the astronomer Yahya ibn Abi Mansur. There are references to activity in astronomy and mathematics there. That is very nearly the whole of the contemporary evidence.

The leading modern study of the translation movement is Dimitri Gutas's *Greek Thought, Arabic Culture* (1998), and its reading of the evidence is deflationary in a way that has shaped the field. Gutas concludes that the *bayt al-hikma* was **a library**, most probably established as a bureau under al-Mansur as part of an Abbasid administration modelled on the Sasanian one, whose primary function was to house the activity and the results of translations *from Persian into Arabic* of Sasanian history and culture, and which accordingly employed translators for that purpose and bookbinders to preserve the volumes. He states the negative conclusion directly: *It was certainly not a center for the translation of Greek works into Arabic.* Nor, on his account, was it an academy for teaching the ancient sciences.

The single most telling piece of evidence is an absence, and it is worth stating in full because it is the sort of argument that can be checked. **Among the dozens of reports that survive about the translation of Greek works into Arabic — who translated what, for whom, from which manuscript, at what price — there is not one that mentions the *bayt al-hikma*.**

This is contested and should be flagged as such. Scholars, particularly in Iran, have argued that Gutas underweights the evidence and that his reconstruction reflects a broader scepticism about state-directed intellectual programmes; the critique published in *Research on History of Medicine* in 2018 is representative. Other historians accept the deflation of the institution while emphasising that it may have created an environment in which translation was supported, so that its contribution was indirect. What is not in serious dispute is that the evidence is thin, that no source describes an academy, and that the picture of a great multi-faith research institute under one roof is not derived from the primary material.

This study leans to the deflationary reading, for the ordinary reason that an argument from the systematic silence of the relevant sources is a strong argument, and it takes the following as the position.

There was an architect's hour here, and it built something much smaller than the legend. Al-Mansur, reorganising a state on Sasanian lines, established a palace library and translation bureau on the Sasanian model — an ordinary piece of administrative fitting-out, of the kind a chancery requires. Its business was the Persian material a Persianate administration needs: history, statecraft, astrology, the record of how kings had governed. Later, under al-Ma'mun, it seems to have housed astronomical and mathematical work as well.

And the translation movement was very much larger than it. That is the finding that matters. The movement ran for two centuries, consumed enormous sums, employed hundreds of people, and was financed and directed not by one institution but by the caliphs personally, by their viziers, by the great families, by wealthy private patrons, and by the professional translators themselves operating as contractors. Part VII describes the industry. It has the shape of a **market**, not a ministry.

Which is exactly what the framework predicts, and the reason it predicts it is worth naming. **A programme that has one institution behind it has one point of failure and one person's field of the visible.** A programme distributed across a court, a bureaucracy, a dozen private patrons and a professional trade

has as many fields of the visible as it has patrons, no coordinating intelligence, and no stopping rule — which is why it covered ground that no single director would have authorised, and why it lasted longer than any single reign.

PART VI

The Four Appetites

If the demand did not come from an academy, where did it come from? It came from four positions, each with a concrete and unromantic need, and between them they account for the great bulk of what was translated.

The first is astrology, treated in Part III. It required Ptolemy, the Indian *siddhantas*, Dorotheus of Sidon, Vettius Valens, and behind them the whole apparatus of spherical astronomy and trigonometry. It was a permanent, funded, hereditary court function with an insatiable appetite for better tables, and better tables require better observations and better theory. Astrology is the single largest driver in the early phase, and the modern embarrassment about it is the main reason it is understated in popular accounts.

The second is medicine. The caliph and his household needed physicians; physicians needed texts; the available texts were Galen and Hippocrates, in Greek or in Syriac translation. The Bukhtishu family, Nestorian Christians associated with Gundeshapur, served as court physicians across generations, and their patronage made medical translation a profession. Galen alone is an enormous corpus — a competent physician needed dozens of works — and the demand for accurate versions is what produced the professional translation industry described in the next part. Court medicine is not a scientific programme. It is a rich man buying the best available care, repeatedly, for two hundred years.

The third is administration. The Abbasid state taxed agricultural land in Iraq, which meant surveying it; maintained a canal network, which meant hydraulic engineering and levelling; assessed and collected in a bimetallic currency across an empire, which meant arithmetic; and divided estates under a religious law of extreme arithmetical complexity, which meant algebra. Part VIII is about the last of these. The administrative demand is the least glamorous and the most continuous.

The fourth is theological combat, and it is the one most often missed.

Baghdad in the ninth century was the most religiously plural city in the world. Muslims of several schools, Nestorian and Jacobite and Melkite Christians, Jews, Zoroastrians, Manichaeans, dualists and sceptics lived in it and argued in it, often in formal public disputation before patrons. Christian and Manichaean disputants had at their disposal a formidable inherited apparatus: Aristotelian logic, the categories, the syllogism, centuries of Greek philosophical technique honed in the christological controversies.

Muslim theologians engaging them without that apparatus were outgunned, and knew it. The rationalist school known as the Mu'tazila — which is the school al-Ma'mun would later try to impose by force — made a systematic effort to acquire it. **Aristotle's logical works were translated because Muslim controversialists needed to win arguments against Christians, and Christians had Aristotle.**

That is a competitive dynamic and it produced exactly what competitive dynamics produce: a technique acquired to defeat an opponent, which then reshapes the party that acquired it. The logical and philosophical corpus entered Arabic as ammunition and stayed as a discipline, and within a century al-Kindi was writing philosophy rather than polemic and al-Farabi was writing commentary on the *Organon*.

Set the four appetites side by side and note what is not among them.

None of them is the preservation of knowledge. Nobody in this study is recorded as having translated a Greek book because it would otherwise be lost. The corpus was acquired because a court needed horoscopes, a caliph needed doctors, a treasury needed surveys, and a theologian needed a syllogism. **Preservation is what happened while four groups of people were solving four unrelated problems, and it is nobody's achievement.**

PART VII

The Industry

The translation movement was a trade, with prices, contracts, quality standards, competitors and reputations, and reading it as an industry rather than as a scholarly vocation explains most of its features.

The leading firm belonged to Hunayn ibn Ishaq. A Nestorian Christian from Hira, born about 809, he learned Greek well enough to work from the originals — which many translators could not, working instead from Syriac intermediaries — and built an organisation: his son Ishaq, his nephew Hubaysh, and other assistants, with a division of labour between Greek-to-Syriac and Syriac-to-Arabic work, and Hunayn himself revising.

His methods are recoverable because he described them. In a treatise usually called the *Risala*, addressed to a patron, Hunayn set out an inventory of the works of Galen — on the order of a hundred and twenty-nine of them — recording for each what versions existed, who had translated it, into what language, for which patron, and how good the result was. That document is one of the most remarkable pieces of technical bibliography before the modern era, and its purpose is commercial: it tells a patron what is available, what is defective, and what still needs doing.

His method was also textual-critical in a way that would not be bettered for centuries. He collected multiple Greek manuscripts of a work, collated them, and established a text before translating — because he had found that single manuscripts were corrupt. He translated for sense rather than word by word, against the prevailing practice.

The tradition that he was paid the weight of his translations in gold circulates widely and should be treated as a topos rather than as an accounting record; what is not in doubt is that the money was very large and that translation made men rich.

The patrons were plural and mostly private. Caliphs paid, certainly — al-Ma'mun above all. But so did viziers, provincial governors, court physicians, and above all wealthy private individuals. The three sons of Musa ibn Shakir, known as the Banu Musa, were a family of mathematicians and engineers who commissioned translations at their own expense, sent agents to Byzantine territory to buy manuscripts, and paid working translators a monthly retainer. That is private venture funding of research, in the ninth century, by men who wanted the books for their own work.

And there was a supply-side revolution that made all of it cheap enough to matter. Paper, a Chinese technology, reached the Islamic world through Central Asia in the eighth century — the story that the technique was obtained from prisoners taken at the battle of Talas in 751 is traditional and is regarded with some scepticism — and a paper manufactory was operating in Baghdad by the 790s. Paper is dramatically cheaper than papyrus or parchment; a large book on parchment consumes a herd. The translation movement, the bookselling trade, the great libraries and the culture of written scholarship that followed all rest on a substrate that arrived, from outside, at exactly the right moment and for reasons entirely unconnected to any of them.

Assemble the industry and the shape is clear.

There is **demand** from four independent quarters, none of which is scholarship. There is **supply** in the form of a Syriac-speaking Christian professional class with the languages and the training. There is **finance** from the court and from private wealth, competing for prestige. There is **a technology** that has just made the physical product an order of magnitude cheaper. And there is **an ideology** — Part IV's repatriation doctrine — that makes the whole enterprise politically respectable.

Nobody designed that configuration. It assembled itself out of an imperial legitimacy problem, a religious minority's professional niche, a Chinese manufacturing process and a Zoroastrian story about Alexander.

PART VIII

The Estate Division

Muhammad ibn Musa al-Khwarizmi worked in Baghdad under al-Ma'mun, to whom he dedicated both his algebra and his astronomical tables. Two words in the English language come from him: *algebra*, from the title of his book, and *algorithm*, from his name as it was rendered in Latin.

His *Kitab al-mukhtasar fi hisab al-jabr wa'l-muqabala* — the Compendious Book on Calculation by Restoration and Balancing, written around 820 — is conventionally called the foundation of algebra as an independent discipline, and the description is fair: it treats equations as objects in their own right, classifies them into types, gives general solution procedures, and proves them geometrically.

And it announces, in its own preface, what it is for. Al-Khwarizmi says he has confined the work to what is easiest and most useful in arithmetic, such as men constantly require in cases of *inheritance, legacies, partition, lawsuits, and trade*, and in all their dealings with one another, or where the measuring of lands, the digging of canals and geometrical computations are concerned.

That is not modesty and it is not a marketing line. **About half the book is devoted to the Islamic law of inheritance**, and the reason is that the law of inheritance is arithmetically brutal.

Islamic succession law assigns fixed fractional shares to specified heirs — a widow, daughters, sons, parents, siblings — with the shares varying according to which relatives survive, with rules for cases where the fixed shares over-subscribe the estate and must be proportionally reduced, with provision for bequests limited to a third, and with complications for debts, for the freeing of slaves, and for an heir who dies before the estate is divided. A working judge or notary faced these problems constantly, and getting them wrong had consequences in property and in law.

Al-Khwarizmi wrote a book of algebra because estates had to be divided correctly.

Two observations follow, and the second is the one this study is for.

The first is that the applied problems in the book are, without exception, reducible to linear equations. The theory of quadratics — which is the mathematically original part, and the part that made the book immortal — is developed at length and never used in the applications. Scholars have noticed the oddity: a single work serves both as a treatise on a new theoretical subject and as a practical handbook, and the two halves barely touch.

That is the by-product visible in the primary document. The position generated the demand for a practical manual on division of estates. The man who answered the demand happened to be a first-rate mathematician, and while writing the manual he built a general theory of second-degree equations that the manual did not need. **The commission produced the book; the man produced the mathematics; and nobody was in a position to tell the difference at the time.**

The second is what happened to it afterwards, which no one involved could have seen. Al-Khwarizmi also wrote a treatise on calculation with Indian numerals — the positional decimal system with a zero. The Arabic original is lost. What survives are Latin adaptations made in the twelfth century, one of which opens *Dixit Algorizmi*, "Thus spake al-Khwarizmi," and is known as *Algoritmi de numero Indorum*. Both the algebra and the arithmetic were translated in twelfth-century Spain, by Robert of Chester and Gerard of Cremona and Adelard of Bath, and became the standard European texts for four hundred years.

The decimal system reached Europe under his name; the corrupted form of his name became the word for a computational procedure; and the word is now attached to the machinery that sorts the world's information. The chain runs from the division of a dead man's property under religious law in ninth-century Iraq to a term of art in twenty-first-century computing, through a Latin mistranscription.

PART IX

The Caliph Who Measured the Earth

Al-Ma'mun, who reigned from 813 to 833, is the caliph the whole legend attaches to, and he did in fact do something that no other ruler of the period did.

He commissioned a measurement of the size of the earth.

The *Almagest* gave a value for the circumference, derived ultimately from Eratosthenes and transmitted through Ptolemy, expressed in Greek stades — a unit whose length was uncertain, which made the figure unusable for anyone who wanted to compute distances in Arabic miles. So al-Ma'mun sent out surveying parties to determine, by direct measurement, the length of one degree of the meridian.

The best-attested expedition worked on the plain of Sinjar, in northern Mesopotamia, chosen because it is flat and open. Two teams started from a common point and travelled in opposite directions, north and south, measuring the distance as they went by rod and rope, until each found by astronomical observation that the elevation of the pole had changed by one degree. They then compared results. The figure obtained is given in the sources as about fifty-six and two-thirds Arabic miles to the degree, which — depending on which value one assigns to the mile, and the sources do not agree — yields a circumference within a few per cent of the true value.

The purposes were entirely practical. A correct figure for the degree is required for cartography, for the computation of distances across an empire that ran from Central Asia to North Africa, for determining the direction of Mecca from any given place, and for the astronomical tables the court's astrologers depended on. Al-Ma'mun also commissioned a world map and a revised set of astronomical tables, and supported observatories at Baghdad and Damascus where the fundamental parameters of Ptolemy's system — the obliquity of the ecliptic, the length of the solar year, the motion of the sun's apogee — were re-observed and corrected.

That last item deserves its own sentence. **The astronomers al-Ma'mun paid did not merely translate Ptolemy; they checked him, and found him wrong in places, and said so.** The corrections were incorporated into a body of tables and observations that later Islamic astronomers extended for six hundred years, and on which Copernicus was still drawing.

The reader of this collection will recognise the shape, because it appeared in an earlier volume in almost identical form.

In 1669 a French finance minister's academy sent Jean Picard to measure an arc of the meridian between Amiens and Corbeil, because a state that wants to tax and map a kingdom needs an accurate value for a degree of latitude. In the 1790s the same institution sent Delambre and Méchain from Dunkirk to Barcelona for the same measurement, on a much larger scale, to define a unit of length that would belong to no nation. And in the 820s an Abbasid caliph sent parties onto the plain of Sinjar for the same measurement, for the same class of reasons.

Three states, a thousand years apart, in different civilisations, all measured the meridian — and all of them did it because a state that wants to govern territory needs to know how big the world is. None of them was pursuing cosmology. All of them advanced it. That is convergence in the framework's precise sense: not contact, not influence, but the same solution arrived at independently by people in the same structural position, because the position permits few solutions.

PART X

The Inquisition

The ledger requires the other half of al-Ma'mun, and it is not a footnote.

The Mu'tazila were a school of Islamic theology committed to the use of reason in doctrine, and one of their positions concerned the status of the Quran. Against the traditionalist view that the Quran is the uncreated, eternal speech of God, the Mu'tazila held that it was **created** in time — on the argument that an eternal Quran alongside an eternal God compromised God's absolute unity and transcendence.

Al-Ma'mun held that position. In 827 he proclaimed it. And in 833, about four months before his sudden death, he instituted a *mihna* — a trial, an examination, an inquisition — requiring judges, jurists, traditionists and officials to affirm the createdness of the Quran. Those who refused faced dismissal from office, loss of stipend, imprisonment, flogging, and in some accounts death.

It continued under his successors al-Mu'tasim and al-Wathiq. Its most celebrated victim was Ahmad ibn Hanbal, the jurist and traditionist, who was brought in chains before the court, refused to affirm the doctrine, was imprisoned and flogged, and did not yield. It ran for some fifteen to eighteen years — the sources and the scholarship give the terminal date variously as 848 or 851 — until the caliph al-Mutawakkil reversed it and declared the Quran uncreated.

Several things must be said about this, and they pull in different directions, which is why the entry is here.

The most rationalist caliph in the history of the office instituted the only sustained doctrinal inquisition in early Islamic history, and did it to enforce a rationalist doctrine. The patron of the translation movement, the man who sent surveyors to measure the earth and paid Christians and Jews and Zoroastrians to render Greek philosophy into Arabic, used state power to compel assent to a proposition about the metaphysics of scripture, and had a scholar flogged for declining.

And he lost. The *mihna* failed. It failed practically, in that it did not produce assent; it failed politically, in that it made the traditionists into heroes and the state into a persecutor; and it failed permanently, in that its abolition is generally read as the moment the caliphate abandoned its claim to determine orthodoxy. The office never recovered that claim. Religious authority in Sunni Islam passed to the scholars, the *ulama*, and has stayed there.

The framework has something exact to say about this, and it is not a moral judgment. A ruler who has spent his reign patronising rational theology has, by the end of it, a court, a chief judge and an intellectual establishment all committed to a doctrinal position that the general population's religious authorities reject. That is an unstable configuration, and it has two exits: retreat, or enforcement. Al-Ma'mun chose enforcement, four months before he died, and his successors were locked into it because reversing it would have discredited the men who had staked their careers on it. **The inquisition is what a patronage programme turns into when the thing it has been patronising becomes a party.**

The relevance to this study's central question is direct. It is often argued that the translation movement flourished because the Abbasid state was tolerant and rational, and that it declined when religious orthodoxy reasserted itself. The chronology does not support the simple version. **The state was at its most intellectually adventurous and at its most coercive in the same reign, and the translation movement continued for a century after the inquisition was abolished.** Patronage of philosophy and persecution of theologians were not opposites here. They were two expressions of the same conviction, held by the same man, that the ruler's business included what people ought to think.

PART XI

What the Institution Never Was

The House of Wisdom that most readers have heard of — the great academy, the multi-faith scholarly community, the deliberate salvage of civilisation — is substantially a modern construction, and tracing how it was built is worth doing because the construction follows a pattern this collection has named.

The raw materials are real. There was a *bayt al-hikma*. There was a translation movement of genuinely extraordinary scale. There were scholars of several faiths working under Abbasid patronage. Al-Ma'mun did fund astronomy and did commission the measurement of the earth. Every element of the legend has something behind it.

What was added is **institutional consolidation**: the attribution to one named body, at one place, under one founder, of an achievement that was in fact distributed across two centuries, a dozen patrons, several cities and an entire professional trade.

That addition happened in stages, and each stage is intelligible from the position of the people making it. Medieval Arabic authors writing centuries later, working from fragmentary references, naturally organised a diffuse phenomenon around the institution they had a name for. Nineteenth- and twentieth-century European Orientalists, trained on the model of the academy and the university, read the references through that model. And twentieth-century writers in the Islamic world and outside it, with entirely understandable motives, found in it a usable emblem — a golden age with an address.

There is a further embellishment attached to the end of the story, and it should be handled carefully because it is moving and it is probably not true.

In February 1258, Hulegu — the Mongol commander whose destruction of the Nizari Ismaili state two years earlier is the subject of a companion volume in this collection — took Baghdad, executed the last Abbasid caliph, and killed a very large number of its inhabitants. The city never recovered its position. That much is not in dispute and is one of the great catastrophes of the medieval world.

The image usually attached to it — that the libraries were thrown into the Tigris, and that the river ran black with the ink of books and red with the blood of scholars — **is a literary topos that appears in later sources and should be flagged as such rather than reported as fact.** Contemporary accounts of the sack are extensive and the ink-in-the-river image is not securely among them. It has the shape of a formula rather than of a report.

More importantly for this study, **there is no good evidence that the *bayt al-hikma* still existed as an institution in 1258.** The references to it thin out and stop long before. Whatever it was, it appears to have ceased functioning generations earlier, in the ordinary way of an administrative bureau in a state whose administration had been repeatedly overturned. The dramatic version — a great academy destroyed in an afternoon, ending a golden age — telescopes a slow institutional fade and a real military catastrophe into a single scene.

The pattern here is the mirror image of the one this collection's paper on founding texts identifies. That paper argues that historians too readily dissolve a real author into an anonymous process. This case shows the reverse failure: **a real process assembled into a single institution and a single founder, because a story requires an agent and a diffuse two-century phenomenon does not supply one.** Both errors have the same root, which is the assumption that the scale of an outcome tells you something about the concentration of its cause.

PART XII

The Long Transmission

The last claim in the received account is that this material laid the groundwork for the European Renaissance, and it needs the same treatment as the rest: real, and smaller and more circuitous than advertised.

What actually happened is a second translation movement, six hundred miles west and three hundred years later, and it has its own positions and its own architects.

The Arabic corpus entered Latin Europe principally through three doors.

Spain, and above all Toledo, taken by Castile in 1085 with its libraries substantially intact and its Arabic-reading Mozarab and Jewish populations in place. From the middle of the twelfth century a sustained translation effort worked there. Gerard of Cremona is the outstanding figure: he went to Toledo, by the standard account, in search of the *Almagest*, which was not available in Latin, learned Arabic, and stayed for the rest of his life, producing on the order of seventy translations — Ptolemy, Euclid, Archimedes, Galen, Avicenna's *Canon*, al-Khwarizmi's algebra, and a great deal more. Robert of Chester translated the algebra as well. Adelard of Bath translated al-Khwarizmi's astronomical tables and Euclid's *Elements*.

Sicily, which had been under Muslim rule and then Norman, where Greek, Arabic and Latin were all in official use and where translation was made from both Greek and Arabic originals.

And the crusader Levant and southern Italy, where Constantine the African had brought Arabic medical texts to Salerno and Monte Cassino a century earlier.

Now the honest scope of the claim, in three parts.

What is well founded. A great deal of ancient science and medicine reached Latin Europe in the twelfth and thirteenth centuries in Arabic versions, and a substantial body of original Arabic work — Alhazen on optics, Avicenna on medicine, al-Khwarizmi on algebra and Indian numerals, the astronomical corrections of the Baghdad and Maragha observatories — went with it. The scholastic recovery of Aristotle, which reorganised European intellectual life, ran largely through Arabic and through Averroes' commentaries. The Latin words *algebra*, *algorithm*, *alcohol*, *alkali*, *zenith*, *nadir*, *azimuth*, and the names of a great many stars, record the route.

What needs qualifying. Not everything came that way. Some Greek texts came directly from Byzantium, and from the thirteenth century William of Moerbeke and others translated Aristotle straight from the Greek, in some cases displacing the Arabic-mediated versions. The Renaissance's own humanists took their Greek from Byzantine manuscripts and Byzantine émigrés, particularly after 1453. The picture of a single pipeline is wrong.

And what is simply false is the framing. The claim that Europe was "languishing in the Dark Ages" while this happened is a Renaissance polemical construct that historians abandoned generations ago; the twelfth century in Europe was a period of vigorous institution-building, and it is precisely because Latin Europe was expanding and confident that it went looking for the books. **The transmission happened because there was demand at the receiving end, not because there was charity at the sending end.**

Which returns the study to its own subject. Nobody in ninth-century Baghdad was preserving anything for anybody. The corpus survived in Arabic because four sets of people wanted it for four unrelated reasons, and it reached Latin Europe because a fifth set of people, three hundred years later and a continent away, wanted it for a sixth reason. Not one of those transactions was a gift, and the result of all of them together is the transmission of the scientific inheritance of antiquity to the culture that would eventually do something with it.

PART XIII

The Ledger

Both columns, in ink.

In the column of the achievements, which are enormous and which no deflation of the institution touches: between the middle of the eighth century and the tenth, very nearly the whole surviving corpus of secular Greek science and philosophy available in the Near East was rendered into Arabic — astronomy, mathematics, medicine, physics, botany, mechanics, logic, metaphysics — with a thoroughness and a technical standard that had no precedent and would have no parallel until the modern era. Hunayn ibn Ishaq's collation of manuscripts before translating is textual criticism of a kind Europe would not practise for six hundred years. Al-Khwarizmi's algebra founded a discipline. The decimal positional system with zero was carried west and is now how the species counts. Ptolemy was not merely translated but tested and corrected, and the corrections fed a tradition of observational astronomy that ran for six centuries and that Copernicus was still using. Alhazen's optics is arguably the first sustained experimental research programme in the modern sense. And the whole of it was done in a working environment where Muslims, Christians, Jews, Zoroastrians and unbelievers were paid to do the same work in the same rooms.

In the column of the costs: the money came from the tax revenues of an empire that ran on agricultural extraction from a peasantry with no voice in any of it, and on slavery, including the vast plantation labour force in southern Iraq whose revolt was crushed with great violence in the 880s. The astrology that drove much of the astronomical programme was a false doctrine used to underwrite dynastic power. And the most enlightened caliph in the sequence instituted an inquisition that imprisoned and flogged scholars for eighteen years over a proposition about the nature of scripture, and in doing so destroyed the caliphate's own religious authority permanently.

The case resolves, as this project's cases tend to, against both easy pictures.

It was not a programme for the advancement of knowledge. No caliph is recorded as having translated a Greek book in order to preserve it. The demand came from a court that needed horoscopes to prove its accession was written in the heavens; from a household that needed physicians; from a treasury that needed surveys, canals and estate divisions; and from theologians who needed Aristotle's logic to beat Christians in public argument. The single most important enabling idea was a Zoroastrian story, invented by Sasanian priests to explain a defeat, which recast the acquisition of Greek learning as the recovery of stolen Persian property.

And it was not an accident. Al-Mansur reorganised a state and founded a city on an elected date. Al-Ma'mun funded observatories, commissioned the measurement of a degree, and proclaimed a doctrine. Hunayn built a firm with a method and a catalogue. The Banu Musa sent agents into Byzantine territory with money to buy manuscripts. Every one of them intended what he did.

It was an architect's hour, and then another — 750, 762, the adoption of the repatriation doctrine, the founding of the library bureau, the 770s Indian embassy, al-Ma'mun's observatories and his inquisition, Hunayn's workshop, and then Toledo three centuries later — each a bounded episode in which real people solved a pressing problem with the materials at hand, skewed the settlement toward their own position, and handed the result to a structure that carried it forward on a logic none of them chose.

Now the two findings this volume was written for.

The first is that the institution at the centre of the legend is smaller than the legend, and the legend is a construction. On the best current reading of the evidence, the *bayt al-hikma* was a palace library and translation bureau on the Sasanian model, whose business was Persian material, and which no surviving

report connects to the translation of a single Greek book. The great movement was not housed anywhere. It was a distributed market, funded by dozens of patrons across two centuries, with no director, no plan and no stopping rule — which is precisely why it was comprehensive, and why it lasted, and why no single reign or reversal could end it. **The absence of an institution is not a defect in the story. It is the explanation.**

And the second is about the sign of the outcome. This is now the third study in this collection to examine an institution whose consequences ran far past its makers in the direction of the good, and the mechanism has been identical in all three. Colbert wanted maps for taxation and bought a permanent capacity to measure. AT&T wanted a wire that did not hiss and bought a permanent capacity to detect very faint signals. The Abbasids wanted a cosmically legitimate dynasty and a correctly divided estate, and bought a permanent capacity to translate, compute and observe.

In each case what was purchased was a capability, and a capability does not expire when its commissioning purpose does. It sits there, maintained by whoever holds the money, and it is available to whoever comes next, for uses nobody has yet imagined. That is why the good outcomes in these three cases arrived late, arrived elsewhere, and arrived in hands the founders would not have recognised.

The rule this collection adopted two volumes ago holds here without amendment. Legibility is not pardon, and it is not credit. Al-Mansur is not owed the thanks of the species for the survival of Euclid, any more than the forger of the Donation of Constantine is owed the blame for a line drawn through the Atlantic. Both propositions follow from the same fact: a man in a chair sees the problem in front of him, and cannot see and cannot govern what the thing he builds will meet after he is gone.

The most durable thing in this story is not a caliph, not a library, and not a plan. It is a story told by defeated priests about a Macedonian who burned their books — a story that was almost certainly false, that was invented to explain a humiliation, and that persuaded a dynasty three centuries later that translating the science of the world was not an indulgence but a debt.

Held, like everything in this project, as tested, not revealed.

A Note on Sources

This is a work of synthesis, and every quotation and figure has been verified to a published source; none is invented. Where scholarship is divided, the division is reported.

On the translation movement generally. The standard modern study, and the source of this volume's central interpretive framework, is Dimitri Gutas, *Greek Thought, Arabic Culture: The Graeco-Arabic Translation Movement in Baghdad and Early 'Abbasid Society (2nd–4th/8th–10th centuries)* (Routledge, 1998). The popular accounts that present the House of Wisdom as a great academy include Jonathan Lyons, *The House of Wisdom: How the Arabs Transformed Western Civilization* (2009), and Jim al-Khalili, *The House of Wisdom* (2011); they are cited here as representative of the received picture rather than as authority for it. George Saliba's *Islamic Science and the Making of the European Renaissance* (2007) and the work of A. I. Sabra are the standard correctives on the science itself.

On the founding and the landscape. The Abbasid revolution of 750, the Khurasani base, the Persian character of the administration and the Barmakid vizierate follow the standard histories of the caliphate. The founding of Baghdad by al-Mansur is dated 30 July 762 in the standard reference works; some sources give 31 July, reflecting the conversion from 4 Jumada al-Awwal 145 AH, and the discrepancy is flagged rather than resolved. The state of Greek scholarship in ninth-century Byzantium follows the standard Byzantine literature, and the parallel case is treated in this collection's volume *The Last Roman Office*.

On the horoscope of Baghdad. The account derives from al-Biruni in the eleventh century and Yaqut in the thirteenth; the team is given as headed by Nawbakht the Persian, who came to the court as a Zoroastrian and converted, with Masha'allah ibn Athari, Muhammad ibn Ibrahim al-Fazari and Umar ibn al-Farrukhan al-Tabari among the others. The practice is electional astrology, *ikhtiyarat*. The chart's placement of the sun in Leo and Jupiter rising in Sagittarius follows the published reconstructions; the exact time is not given by al-Biruni and the reconstructions vary. The hereditary character of the Nawbakht family's court role follows the standard literature on Abbasid astrology. The role of astrological history in Abbasid dynastic legitimation is developed at length by Gutas and by David Pingree, whose work on the transmission of Persian and Indian astronomy into Arabic underlies this part.

On the Zoroastrian ideology of translation. The doctrine that all sciences derive from the Avesta; that Alexander appropriated the Persian texts, had them translated and destroyed the originals, so that they became dispersed outside Persia; and that their subsequent recovery and translation therefore constituted the recovery of Persian heritage — follows the *Encyclopaedia Iranica* article "Greece x. Greek Medicine in Persia," which states the mechanism directly, and the *Dēnkard* passages translated by Mary Boyce and discussed in the *Encyclopaedia Iranica* article "Alexander the Great ii. In Zoroastrian Tradition." The *Dēnkard* account of Dārāy's two copies, Walaxsh's memorandum to the provinces, and Ardashir's recall of the scattered teachings on Tansar's advice is quoted there from Boyce's translation. The Middle Persian epithet for Alexander, *gizistag*, "accursed," and the hostile Sasanian portrayal preserved in the *Letter of Tansar*, are standard; the British Library's Asian and African studies material notes that the hostile view is itself sixth-century Sasanian propaganda rather than contemporary record, and that the Avesta was transmitted orally

and not written down before the fifth century AD at the earliest — so that **the story of Alexander's destruction of the written Avesta is very probably false, and is flagged as such.** The transmission of the doctrine into Arabic through Abu Sahl ibn Nawbakht, as preserved in Ibn al-Nadim's *Fihrist*, follows Gutas.

On the *bayt al-hikma*. The reconstruction relied on is Gutas, *Greek Thought, Arabic Culture*, pp. 53–60: that it was a library, most likely established as a bureau under al-Mansur as part of an Abbasid administration modelled on the Sasanian, whose primary function was to house the activity and results of translations from Persian into Arabic of Sasanian history and culture, with hired translators and bookbinders; that it was certainly not a centre for the translation of Greek works into Arabic; and that it was not an academy for teaching the ancient sciences. The observation that among the dozens of surviving reports on Greek-to-Arabic translation not one mentions the *bayt al-hikma* is Gutas's and is the load-bearing evidential point. **This reading is contested**: see the critique published in *Research on History of Medicine* 7:4 (2018), which argues that Gutas's reconstruction is shaped by prior commitments about state direction of intellectual life, and the intermediate position that the institution's contribution to Greek-Arabic translation was indirect, in creating an environment in which such work was supported. The association of al-Khwarizmi and Yahya ibn Abi Mansur with it, and the references to astronomical and mathematical activity there, are attested and are not disputed.

On the appetites. The role of astrology in generating demand for Ptolemy, the Indian *siddhantas*, Dorotheus and Vettius Valens follows Pingree and Gutas; the Sindhind material brought by the embassy from Sind in the 770s and worked up by al-Fazari is standard. The Bukhtishu family of court physicians and the Gundeshapur connection follow the standard medical-historical literature; the scale and character of the Gundeshapur institution are themselves contested and the claim is kept modest here. The administrative demands of land survey, canal maintenance and inheritance division follow the standard economic and legal histories. The role of interconfessional disputation in Baghdad in generating demand for Aristotelian logic, and the Mu'tazila's systematic acquisition of it, follow Gutas and the standard histories of *kalam*.

On the industry. Hunayn ibn Ishaq's life, his workshop with his son Ishaq and nephew Hubaysh, his knowledge of Greek, his practice of collating multiple manuscripts before translating, and his sense-for-sense method, follow the standard literature. His *Risala* on the Syriac and Arabic translations of Galen, inventorying on the order of 129 Galenic works with their existing versions, translators, patrons and quality, is the principal document. **The tradition that he was paid the weight of his translations in gold is a topos and is flagged as such.** The Banu Musa's commissioning of translations, their agents sent to Byzantine territory to acquire manuscripts, and their retainer payments to translators follow Gutas. The arrival of paper in the Islamic world and the operation of a paper manufactory in Baghdad by the 790s follow the standard histories; **the tradition that the technique was obtained from prisoners taken at Talas in 751 is regarded with scepticism by specialists and is flagged as contested.**

On al-Khwarizmi. The *Kitab al-mukhtasar fi hisab al-jabr wa'l-muqabala*, written around 820 and dedicated to al-Ma'mun, together with his astronomical tables. The statement of purpose is quoted from Frederic Rosen's translation as reproduced in the standard reference literature, including the MacTutor biography: that he intended to teach what is easiest and most useful in arithmetic, such as men constantly require in cases of inheritance, legacies, partition, lawsuits and trade, and in all their dealings with one another, or where the measuring of lands, the digging of canals and geometrical computations are concerned. That about half the book concerns the Islamic law of inheritance, and that the applied problems

are without exception reducible to linear equations while the quadratic theory is never used in them, follows the standard scholarship and is developed by Jeffrey Oaks. The lost Arabic treatise on Indian numerals, surviving as the Latin *Dixit Algorizmi* / *Algoritmi de numero Indorum*, and the twelfth-century Latin translations by Robert of Chester, Gerard of Cremona and Adelard of Bath, follow the standard sources; the Latin versions are known to depart substantially from the originals.

On the measurement of the earth. Al-Ma'mun's commissioning of a determination of the length of a degree of the meridian, the expedition on the plain of Sinjar with two parties travelling north and south from a common point until the pole's elevation changed by one degree, and the resulting value of about 56⅔ Arabic miles to the degree, follow the standard histories of Islamic astronomy; **the conversion to modern units depends on the value assigned to the Arabic mile, on which the sources do not agree, and the resulting circumference is therefore given here only as within a few per cent.** The observatories at Baghdad and Damascus, the re-observation of the obliquity of the ecliptic and the solar parameters, the world map and the revised tables follow the same literature. The comparison with Picard (1669–70) and with Delambre and Méchain (1792–99) draws on this collection's volume *The Measure of the Earth* and the sources cited there.

On the *mihna*. Al-Ma'mun's proclamation of the doctrine of the createdness of the Quran in 827 and his institution of the *mihna* in 833, approximately four months before his death; its continuation under al-Mu'tasim and al-Wathiq; the interrogation, imprisonment and flogging of Ahmad ibn Hanbal; the role of the chief judge Ahmad ibn Abi Du'ad; and its abolition by al-Mutawakkil — follow the *Encyclopaedia of Islam and the Muslim World* article on the Mihna, Muhammad Qasim Zaman's work on religion and politics under the early Abbasids, and Nimrod Hurvitz's study of Ibn Hanbal's interrogation. **The terminal date is given variously as 848 and 851 and the duration as fifteen, sixteen or eighteen years, depending on the source; the discrepancy is reported rather than resolved.** John Nawas's reexamination of the explanations for the *mihna* in the *International Journal of Middle East Studies* 26:4 (1994) surveys the competing accounts of al-Ma'mun's motives, which remain disputed.

On 1258 and the legend. Hulegu's capture of Baghdad in February 1258 and the execution of the last Abbasid caliph follow the standard accounts; the Mongol campaign in the region is treated in this collection's companion volume *The Rock and the Rumour*. **The image of the Tigris running black with the ink of destroyed books is a literary topos found in later sources and is flagged here as such rather than reported as fact. There is no good evidence that the *bayt al-hikma* still functioned as an institution by 1258**, and the references to it cease long before; the identification of the sack as the moment of its destruction is a retrospective consolidation.

On the transmission to Latin Europe. The Toledo translations, Gerard of Cremona's journey in search of the *Almagest* and his subsequent output of some seventy translations, Robert of Chester's version of the algebra, Adelard of Bath's translations of al-Khwarizmi's tables and of Euclid, the Sicilian route, and Constantine the African at Salerno and Monte Cassino, follow the standard histories of medieval translation, including Charles Burnett's work. The direct Greek-to-Latin translations of William of Moerbeke in the thirteenth century, and the Byzantine transmission to the Italian humanists, are noted as qualifications on the single-pipeline picture. **The characterisation of the period as one in which Europe was "languishing in the Dark Ages" is a Renaissance polemical construct long abandoned by medievalists and is not used here.**

On the framework. The concepts of *position*, the *field of the visible*, *convergence*, the *architect's hour* and the *institution's logic* belong to the Patterns of Power project of which this paper is part and are developed across its studies, in particular *Position Logic* and *Against the Historian's Reflex*, whose argument about supplied and withheld architects is inverted in Part XI. The symmetric statement of the collection's standing rule — that legibility is not credit any more than it is pardon — is developed in *The Measure of the Earth*, and the distinction between purchasing a result and purchasing a capability, drawn in Part XIII, is developed there and in *The Hiss in the Line*. Where this study's claims err, they should err visibly, in a form the cited scholarship can correct.

Part of the collection Patterns of Power. Tested, not revealed.